



Busy Gasoline Terminal

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The

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FOR THOSE WHO WISH TO LEARN

The Company's policy of promotion from within the ranks has been carried further during the past year through greater attention to an Executive Development Program. This program includes appraisal of supervisors and junior executives in the organization and programs for the training and development of such employees to fill more responsible positions in the organization. Training programs were continued in the various branches of the Company's operations with the objective of helping employees to develop and capitalize upon their abilities. The effort to provide safe working conditions for all employees was emphasized by continuation of a safety program in all operations—From the 1947 ANNUAL REPORT.

IT HAS been suggested in all seriousness that a little learning is a dangerous thing. That is not necessarily true. Under some conditions, it is conceivable that a complete lack of knowledge could be quite harmless. But one thing is always true; a little learning, whether it is harmful or not, seldom accomplishes anything constructive.

In any progressive industry, it takes a great deal of knowledge and training—all kinds of it; much of it specialized—to get the job done properly and on time. For example, it takes a *lot of learning* to discover oil, to produce it, to move it from well to refinery, to refine it into finished products, and to distribute and sell it to consumers.

This is no attempt to cast a cloak of scholarship over the oil industry, or to imply that its workers go about their daily tasks monkishly clad in cap and gown, with textbooks constantly at hand. Nor does it suggest that only college professors need apply. Quite the contrary, a cross-section of the industry's personnel would reveal as many different kinds of people with as many different educational backgrounds working in almost as many different occupations as

one could imagine. Most of them with long years of service have acquired much of their skill and usefulness *on the job*, studying their work and applying new learning as they went along.

Even technically trained men who enter the industry have to work hard to bridge the wide gap between theory and practice. As one highly placed scientist wryly put it, "Process units simply don't understand chemical engineering theory." He was talking about refineries, of course, but his statement holds true for other phases of industry operations. Pipe lines, producing wells, distillation towers, and all the other complicated equipment used in the industry have a disconcerting habit of failing to conform faithfully and comfortably with physical and chemical laws laid down in the classroom.

That is just one of the challenges to people in the industry, who soon learn that they must keep up with changing conditions and constantly changing techniques in exploration, production, transportation, refining, and selling of petroleum and its products. For those who would improve themselves, school is never out.

Humble has always encouraged its people to learn more about their work; training classes were being sponsored as long ago as 1919, when the Company was a scant two years old. Attendance in training classes is on a voluntary basis.

Interest in employee development has grown and broadened since that early beginning, and today Humble uses four broad forms of training; lectures and study in the classroom; literature and visual aids, such as movies, film strips, and slides; meetings and conferences of all kinds to promote learning and understanding; and actual on-the-job instruction. These may be used, and are used, singly or in combination for best results. Scope and intensity of the instruction varies, of course, depending upon the nature of the subject matter, the people to whom it is directed, the manner in which it must be presented, and certain limitations of geography and physical facilities.

On the following pages, each of these four forms is discussed and illustrated.



PRACTICE SCHOOL is the refinery term for this course offered to incoming chemical engineers. Material covered by the course helps new

men bridge the wide gap between theory and practice, is a good refresher course. Flow of superfractionator is sketched on the blackboard.

Classroom Lectures and Study

THIS type of instruction has proved popular and effective in putting across information on a wide range and variety of subjects, including process operations, operation and maintenance of mechanical equipment, research techniques, safety, and all the other myriad phases of the petroleum industry. It has been used at Humble's refineries, in the field, and at the Houston Office and other central offices. It can best be handled, of course, where there are large concentrations of people.

The Sales department makes frequent and ample use of the schoolroom method, and extends that use to many different groups of department people. At present, a Lubrication School is being conducted for sales people in the field.

From time to time, classes are held for clerical people and other groups in the Main Office in Houston and in other central offices. Typical courses offered

are those in shorthand, letter writing, public speaking, and the like.

The nature of the subjects to be taught and concentration of large numbers of people make the classroom method especially well adapted to a place like Baytown refinery.

At intervals of a year or so, Baytown holds an eight to ten weeks "practice school" for chemical engineers. For the new men, this course offers a splendid opportunity to reconcile lately-learned theory with actual practice. For those with experience, it makes a good refresher course. Everyone in the class is given problems to work involving refinery processes and equipment; instructors are drawn from the plant's technical and research personnel.

For the past two years, the "Humble Lectures in Science" have been in progress at Baytown. Several scientists

and educators representing the best in their field are invited each year to give Humble's refinery technical and research people the latest developments in science and technology.

Skilled craftsmen and process men are given classroom instruction, too, supplementing literature and on-the-job training made available to them. Courses are being offered to boilermakers, machinists, sheet metal workers, tool and equipment men, and electricians. As soon as practicable, similar courses will be set up for those in other skilled crafts. Formal credit will be given upon satisfactory completion of each course.

Classroom lectures and study provide an excellent medium in presenting safety training, and this method is used throughout the Company's operations, sometimes alone and sometimes to supplement training films.

Literature, Visual Aids

THE power of the printed word has been recognized for centuries by those whose job it is to spread the general mass of knowledge and information. And, if it can be accepted at face value that "one picture is worth a thousand words," a combination of literature and photographs or films is a valuable training tool indeed.

A considerable volume and variety of printed matter comes regularly to every man and woman in the Company. Besides three publications carrying Company and employee news, a great many booklets and manuals are prepared and used specifically for training purposes. In addition to these, large numbers of pamphlets on subjects of general interest, the Company's annual report, and a wide variety of special reports are circulated among Humble people.

Visual aids include movies, both sound and silent, in color and in black and white; lecture slides and charts; and a myriad variety of still photographs depicting Company life and operations in all phases. Included in the subject matter of these visual aids are safety, training, technical subjects, institutional and informational matters, and sales promotion and training.

Showings of many of these films are Company-wide. Last year there were 2357 showings of all films within the Company, attended by 54,906 employees. There have been 5121 such showings in the last five years, attended by 178,010 employees. Exploration, production, transportation, refining, and sales are all represented among these films and each of those organizations benefits from them.

Representative of the moving pictures produced by the Visual Aids Section for employees are "We Work Together," an institutional film; "All Five," a safety film stressing protection of hands and fingers; "Highway for Oil," a pictorial of pipe line operations; "Thermal Forces," on refining operations; and "What to Say to Sell It," for sales training.

A visual aids library is maintained in the Houston office, from which films and slides are loaned for showing in the field.



INSTRUCTOR AND STUDENT examine a training manual prepared by the Company. On the table are a few representative samples of training literature covering all phases of Humble's operations.



VISUAL AIDS LIBRARIAN withdraws from Houston Office film files a copy of a movie requested for showing to pipe line field employees. Films are used in all phases of training.



SALES MEETINGS may vary in size and specific objectives, but never in general purpose. Large meeting, left, was one of several gatherings



which launched new post-war Esso Extra, Football meeting, right, ties in with Humble sponsorship of Southwest Conference games.

Meetings and Conferences

HUMBLE believes that the meeting and conference method is one of the best ways yet devised to achieve general understanding and allow a free-flowing exchange of ideas. Man-to-man talk across the meeting table or in the conference room has a way of getting at a subject more directly and satisfactorily than could be accomplished through literature and correspondence.

Meetings and conferences are especially well adapted to conditions where many people in a common enterprise are spread over wide geographical

areas. Under such conditions, it becomes necessary from time to time that these people or their representatives get together to discuss common interests and common problems.

Such a method is frequently used by production, pipe line, and sales personnel. In these and other phases of Company operations, regularly scheduled meetings and conferences, as well as those called for specific purposes, keep lines of communication constantly open. They may be held on a Company-wide basis, as in the case of a change in employee welfare and benefit plans which

must be explained and discussed with everyone, or they may cover only a segment of one department's operations and will be attended by only the employees concerned.

Literally thousands of meetings and conferences are held within the Company each year, attended by groups ranging from a few people to several hundred. Subjects for discussion cover a wide range of matters of interest to employees, such as safety, production problems, pipe line techniques, process control, mechanical maintenance, sales promotion, exploration, and others.



SAFETY MEETINGS, LIKE THIS ONE FOR PRODUCTION PEOPLE, ENCOURAGE SAFE PRACTICES ON THE JOB AND AT HOME.



FIRST CLASS MACHINIST, RIGHT, GIVES TRAINEE ON-THE-JOB INSTRUCTION IN THE PROPER HANDLING OF A BIG LATHE.

On-The-Job Instruction

TRAINING and instruction on the job helps Humble people put into practice what they have learned in classrooms, by reading booklets and manuals, through visual aids, and in meetings.

This type of training necessarily takes many forms. It may be a simple, informal "Here, let me show you" or it may range all the way up to a complete and comprehensive program of on-the-job instruction. In either case, it gets results. Paraphrasing Davy Crockett's famous "Be sure you're right; then go ahead," Humble encourages an attitude of "If you're not sure, ask" among its employees.

As an example, operators at the London, American, and Kilgore gas plants

in East Texas were given a combination of class-room and on-the-job training in the operation of those plants. Lectures and theory came first; then came practice drills in the plants. Theoretical problems were set up, and the class worked together toward the best possible solutions. In one such case, it was assumed that fire had broken out at some particular point in the plant. The problem was to determine which valves to close and how to close them in the shortest possible time for plant security. Other problems were concerned with operational matters as well as safety.

Other aids to on-the-job training are manuals setting forth specifications and instructions for proper handling of process equipment at Baytown.

These are of considerable benefit to

new men just coming onto the job, and serve as a continuous guide for experienced men.

The Sales department operates training stations in each of its four districts. At these stations, driveway salesmen are given careful and comprehensive training in all phases of salesmanship, service, and station operation.

In production, the "boll weevil" and the "roughneck" find a helping hand, useful guidance, and advice readily forthcoming from more experienced men on the rig. And so it goes, throughout the Company's operations, wherever and whatever they may be. Humble's philosophy of employee improvement is that it is management's responsibility to help those who would help themselves do a better job.



SHIP AND DRILLING PLATFORM form a dramatic, unusual alliance as they join forces in the common cause of supplying heavy demands for oil. Ship serves as floating warehouse, crew quarters; provides well services. Location is at Caminada Pass, off Grande Isle, Louisiana.

LSTs Help Drill for Oil

WAR breeds strange alliances. So, too, does peace. But it is unlikely, in either peace or war, that necessity has ever brought together in common cause a more bizarre combination than a drilling rig and a big, seagoing war ship.

These ships—Navy LST's which once stormed the bloody beaches of Tarawa and Okinawa—are being converted, in the interests of the oil-consuming public, to the more peaceful and productive use of establishing new beachheads for oil in the Gulf of Mexico. Stripped of weapons and warlike accoutrements and moored securely at Humble's drilling platforms off Grand Isle, Louisiana, they serve as floating warehouses and crew quarters and provide some of the rig services necessary to drill a well.

The ship-and-rig combination was decided upon for economic reasons. Humble's first deep-sea drilling (part of what FORTUNE magazine so aptly called *The Big Gulf Gamble* because it was such a radically new and expensive wildcatting venture) was done from a

massive, fixed platform eight miles off Grand Isle. This platform, still very much in operation, is big enough to hold everything necessary to drill a well—derrick, workmen, machinery, and supplies—and safe enough to withstand the worst fury of the Gulf at this point. But, for routine wildcatting, duplication of such a platform would be expensive. Some cheaper means had to be found, and the ship-rig combination appears to suit the need quite well. This system is not new, however, having been used on a smaller scale in inland waters and in Lake Maracaibo, Venezuela, for many years. It is considerably cheaper, it is working satisfactorily, and ships can be moved from job to job as wells are brought in or holes are abandoned.

LST's are sturdy craft, well suited to hard work, heavy seas, and bad weather. In all, Humble has bought 19 from war-surplus. Two have been fully converted to drilling use and are already in operation in the Gulf; work is under way on three more in a Mississippi River ship-

yard near New Orleans. The other 14, bought on the West Coast, are being towed, two at a time, through the Panama Canal to Orange, Texas, where they will be kept until ready for conversion—a towing job that is perhaps without parallel in the history of peacetime shipping.

Designs and specifications for converting the ships were prepared by the Marine Engineering Section of the Petroleum Engineering Division with the able assistance of the field superintendents and engineers who are to use the equipment. Conversion, which is going forward under the supervision of the Marine Equipment Division of the Production Department, is a major task. It takes several months, hundreds of thousands of dollars, many special skills and a lot of plain hard work to put each ship in shape for Gulf drilling. Every ship is sandblasted to remove rust and scale before it is rustproofed and painted. Gun emplacements are cut away, and the bow doors (which in war-

time opened up to disgorge guns, tanks, and men) are welded tight. The existing hatch in the upper deck is enlarged to provide a permanent opening through which materials stowed below may be reached, and a giant revolving crane, with a boom long enough to swing between this opening and the drilling platform, is mounted forward. Cargo booms, just aft of the forward range of the revolving crane's 115-foot boom, handle lesser lifting jobs. Six huge winches are placed on the top deck, two at the ship's bow and four at the stern, to handle the important job of mooring the ship securely at the drilling platform.

While all this face-lifting process is going on above decks, equally drastic and important changes are being made below. The ship's ballast tanks are converted into mud tanks to serve the rig; two tanks for circulating, two others for reserve mud. (Mud leaves the ship and returns to it via hoses strung between ship and platform.) Two Diesel-powered mud pumps are placed below the top deck near the bow of the ship; complete well-cementing equipment is installed at a lower level farther aft. At the third (the former war tank deck) level, supplies such as mud, cement, and pipe are stored.

Considerable work is necessary to change the arrangement of living quarters for the crew. Comfortable game rooms are provided, galley and washrooms are improved and given tile floors, steel decking in all living spaces are covered with foot-easy Magnesite an inch thick, and fresh water storage systems are changed to suit Humble's purposes. In wartime, an LST had only one fresh water system; Humble's converted ships have three—one for drinking, one for washing, and one for process (drilling) water or ballast water. The water supply, by the way, in its care and storage, meets U. S. Public Health Service specifications, even though the ships are not legally bound to observe such specifications.

When completed, a Humble ST (which, plus the ship's number, is the official designation for each converted vessel) is capable of carrying 3400 tons of equipment and supplies and 59 men, though there are usually fewer than 59 men aboard at any one time. The ships are not self-propelled, but are moved down the Mississippi River and out to their locations in the Gulf by tug.

Each ship is kept securely at its drilling platform by a special arrangement

of mooring lines to seven steel pile anchors and one 10,000-pound ship type anchor. Tension on these lines is pulled up to 30,000 pounds (although the winches are capable of exerting a pull of 100,000 pounds), holding the ship almost motionless in all but bad weather. A special walkway, operating on rollers and a turntable, keeps a constant connection with the drilling platform and allows the ship to rise, fall, and roll gently with the waves without breaking this connection.

The Company's district office at Grand Isle is kept in constant touch with each ship by FM radio. In the event of sickness or other emergency, any man aboard can talk to the folks back home by radio-telephone. An intercom system makes it possible for crewmen to talk between ship and platform.

According to engineers in charge of the work, the ship anchoring system is designed to withstand winds up to 100 miles an hour, on the bow or stern and 80 miles broadside, but forewarning of such winds will make it possible for the ship to be withdrawn from the platform to ride out storms at anchor. (Humble has the services of a trained weather-forecasting expert at its Grand Isle office.) A large stand-by vessel—either a former Navy LCI or Coast Guard cutter—is always near to take men off the platform and off the Humble ST in case of emergency.

If it is intriguing to study the mechanical aspects of this unusual marine drilling venture, it is even more interesting to observe the men and their life on

shipboard. Humble men, as would be expected, take the new work in their stride; most of them already have their "sea legs." They look at it this way: "If oil is to be found and produced at sea, we'll find and produce it there." Even so, they cannot help reflecting now and then on the unusual situations the work presents. As one tool pusher put it, in his good-natured West Texas drawl, "If anyone had told me a year ago that I'd ever be a ship's captain, I'd have thought he was crazy!" (The tool pusher, in charge of operations on the rig, is also nominally the ship's master.)

One interesting (and often amusing) human-interest angle to such operations is the manner in which nautical terms are beginning to creep into the already rich and colorful language of the oil fields. Roughnecks and roustabouts who have already learned the meaning of *cathead*, *mouse hole*, *spinning chain*, and *kelly* have taken on a new idiom. They are still a little self-conscious about it, but they are learning to say *aft* instead of *back*, *forward* instead of *front*, *go below* instead of *climb down the stairs*, and *topside* instead of *upstairs*.

But in all this influx of new and salty terms, one thing remains unchanged. The true Navy man may shudder at this, but there is no smart saluting, no crisp "Aye, Aye, Sir!" in response to instructions. Aboard Humble ST's as on Humble rigs everywhere, the job gets done with a simple, "Okay, Joe; have it for you in a minute."

SHIPS ARE CONVERTED for Humble's use in offshore drilling at this Mississippi River shipyard near New Orleans. Upon completion they are towed to their destination by tugboat.





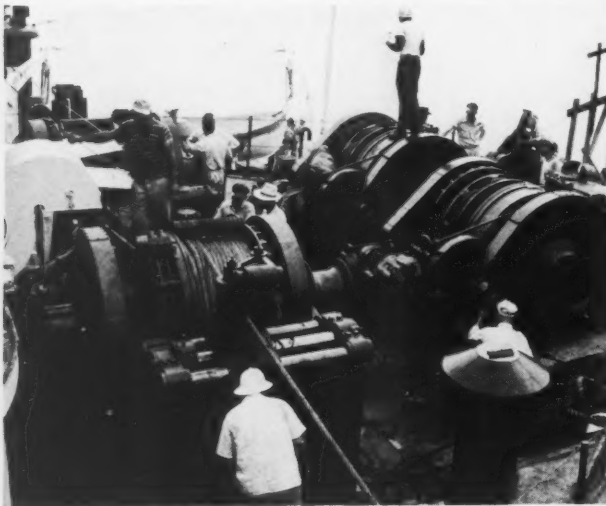
HUMBLY ST 2 (official designation for vessels after conversion) immediately after it had returned from its first shake-down run on

the Mississippi River. Less than a week after this picture was taken, the ship was placed in operation at Tigre Pass, offshore from Grande Isle



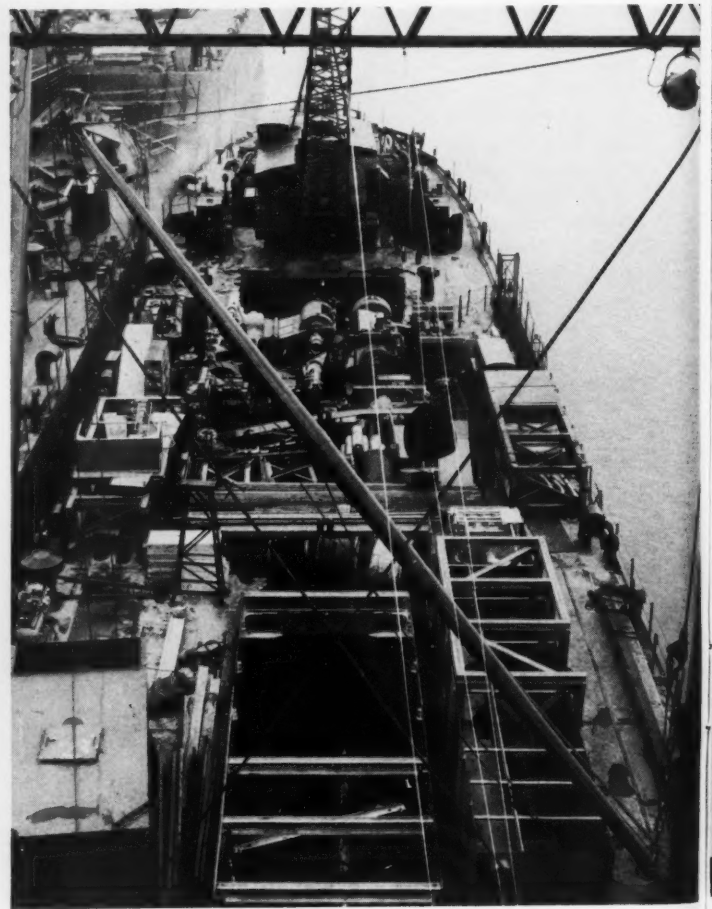
THROUGH PORTHOLE, conversion on deck of former Navy LST makes a busy picture. Work is expensive, takes several months for each ship.

Four winches, handling heavy steel chains and wire rope, are mounted at the stern. These, plus two more at the bow, moor ship at platform.



In the Yards

READY TO GO to Tigre Pass, converted from warlike to peaceful job, the deck of Humble ST 2 is packed with materials and equipment for drilling.



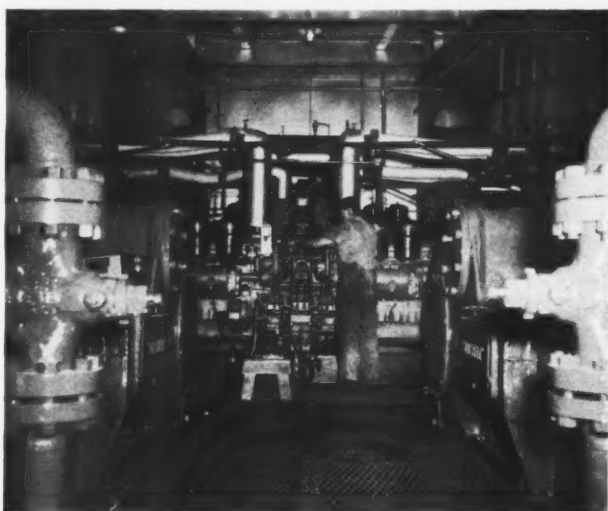
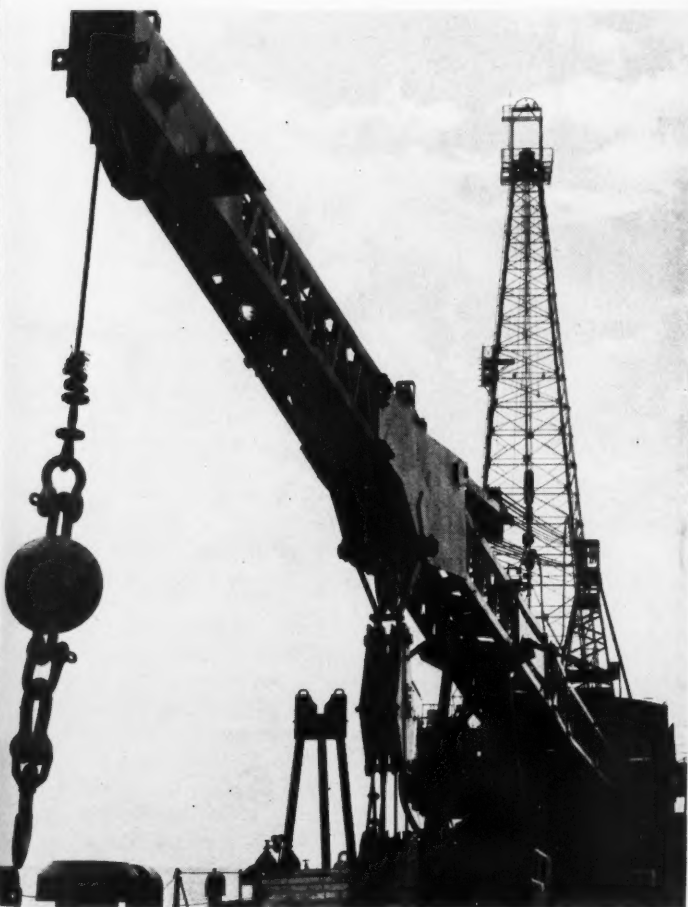


STANDBY BOAT in the foreground, a former Navy LCI, is always kept ready nearby to remove men from ship or platform in event of bad weather,

illness, accident, or other emergencies. Large standby craft gives extra margin of safety in rough seas. Ship-rig drilling team is in background.

In the Gulf

REVOLVING CRANE is mounted near bow of ship. Its tremendous 115-foot boom loads pipe and other materials on ship, transfers them to the platform.



TWO MUD PUMPS operate below top deck near the bow. Mud leaves the ship and returns to it through hoses strung between ship and platform.

Below, a special walkway, operating on rollers and turntable which allows ship to move with waves, connects the ship with the drilling platform.



Vacationlands for All

Part II, describing leading State Parks of Texas located in the state's central and eastern sections

THE CRISP air and coolness of Indian Summer will soon arrive in Texas, glorifying the scenic state with the brilliant woodland coloring of fall. Those who prefer cool autumn vacations will be taking the highways en route to recreation and rest.

Thousands of vacationers have enjoyed Texas State Parks during the past months, in all the warm greenery of spring and summer. Now state parks will see fall visitors grouped in the glow of evening campfires, as the scent of steaks barbecuing and wieners roasting fills the air. The staccato roar of fishermen's motorboats will echo through the autumn stillness, and wood smoke will curl from chimneys of park cabins.

In the May-June issue of *THE HUMBLE WAY* there appeared a description of state parks in the western section of Texas. This article will describe parks in eastern and central Texas.

From border to border Texas has developed its scenic attractions for the enjoyment of everyone by setting aside the best of local beauty for state parks. In east and central Texas, as elsewhere, park visitors will find rustic vacation cottages in quiet natural settings, club houses and dance terraces, picnic nooks, scenic drives, and facilities for fishing, swimming, golfing, horseback riding and other sports.

Lost Pines of Texas

Near Bastrop is a romantic and mysterious forest called the Lost Pines of Texas. Its mystery lies in its origin, because there are no other pines for at least one hundred miles in all directions. It is, in fact, the last pine forest between Bastrop and the west for 700 miles. Hence these tall, lonesome trees are known as the "Lost Pines." An official of the Texas Forest Service has speculated that pine forests once covered the entire area from Bastrop to the coast, but that erosion later deposited soil unsuitable for pines between the two areas. Thus the Bastrop pine area was isolated.

In this forest, east of Bastrop between U. S. Highway 290 and Texas 71, is one of the best developed parks in Texas—

Bastrop State Park. Here the vacationer finds 2100 rolling, timbered acres, a big oval swimming pool, rustic cabins, refectory building, golf course, small lake, picnic areas and shelters, and trails and small bridges.

Nine-Hole Golf Course

As one drives through the park entrance past the nine-hole golf course, he sees the refectory building through the pines ahead. Constructed of native iron-ore stone and heavy timbers, its furniture and fixtures are black walnut, red cedar, and Bois d' Arc—priceless in market value—and its white pine floor is kept highly polished for dancing. Double doors open to an outside terrace where couples may dine and dance or watch swimming and water sports in the park pool. Regular meals and a la carte service may be had indoors or out.

Expert swimmers dive from a tower into the pool's nine-foot deep center section while children splash and play in wading pools at both ends of the oval. A stone bathhouse provides dressing facilities and individual lockers.

Vacation visitors to Bastrop State Park stay in cabins located in the piney woods near a small spring-fed lake.

where some while away the restful hours by fishing. The cabins' two bedrooms, living room, bath, and kitchen are furnished in cedar and pine, equipped with all modern conveniences, and have cooking utensils and dishes for five persons.

For outdoor fun and food there are many picnic areas, gracefully shaded by the Lost Pines and complete with tables and benches, open fire grills, rain shelters, and running water. The park is also connected with the camping and picnic areas of nearby Buescher State Park by a seven-mile scenic drive.

Buescher Park is located one mile northwest of Smithville on Texas Highway 71, and encloses 1,730 acres of wooded, rolling hills. For dancing and other parties there is a large outdoor terrace, and camping and picnicking facilities are situated throughout the area.

Cavern Chambers Brilliant

On a visit to central Texas, the vacationer will probably schedule a stop at Longhorn Cavern State Park near Burnet to visit the third largest cave in the world.

Longhorn Cavern was carved in some ancient time by water slowly seeping its way through numerous cracks and fissures in the porous Ellenburger lime just under the area's surface. Over many centuries this process left narrow tunnels, huge rooms with smooth, curved walls of pure white lime, strange rock formations, stalactites, and crystal deposits which sparkle like diamonds. Explorers have searched over eight miles of this underground wonderland without reaching the end of its myriad passageways. Visitors, however, see only some two miles of the more spectacular chambers, reaching a point about 300 feet deep. The one and one-half to two-hour trip is always cool—year-around temperature is 64 degrees.

A stone stairway leads visitors from the park concession building into the cavern's "Sam Bass" entrance, named for the famous outlaw who supposedly used it for a hideout. Guides direct the





HUGE OVAL SWIMMING POOL at Bastrop State Park attracts many hundreds of visitors each summer. Guests may also dance, play golf,

ride horseback, fish, or picnic. For vacation or week end visits there are cabins and camp sites set among the picturesque "Lost Pines."

way through minor passageways and chambers to Longhorn's Main Room, an immense chamber 183 feet long where powder was manufactured during the Civil War. The names of other cavern chambers and formations — Queen's Room, White Room, Hall of Diamonds, Chandelier Room, Jacob's Well, Boulder Grotto — suggest how lavishly nature decorated Longhorn Cavern.

The cavern is conveniently near the famous dude ranches, recreational facilities, and "Highland Lakes" of Central Texas, and is connected by a scenic road with Inks Lake State Park on the Colorado River.

Other lakes in the area include Lake Buchanan, 32 miles long and a maximum of eight miles wide; Lake Travis, 65 miles long and 8.5 miles wide, just above the dam; and Lake Austin, 20 miles long. These lakes above Austin, which afford ideal boating, fishing, and

camping, are to be developed by the Lower Colorado River Authority into a great park and recreation center known as the Highland Lakes of Texas. More than 42,000 acres of land in the area have been set aside for park purposes.

Scene of Indian Massacre

Turning toward east Texas again, Fort Parker State Park near Mexia offers the vacationer both recreation and historical interest. The main section of the park is located on Lake Springfield, a small lake which is gaining a big

Free printed information on all major Texas State Parks may be obtained by writing to Humble Touring Service, Humble Oil & Refining Company, P. O. Box 2180, Houston, Texas. Complete information may be obtained from the Texas State Parks Board, 106 East 13th Street, Austin, Texas.

reputation among catfish fishermen. Some fabulous "Southern fish fries" have been held in the picnic area near the park docks, where visitors may rent boats. Big oak, walnut, elm, pecan, and willow trees, accented by a heavy growth of grapevines, make picnic nooks up and down the shore secluded and cool.

Guests may dance on the park clubhouse terrace beside the lake, swim, or loll in the sun on the wide grassy swimming beach. The lake shore is walled with cement in the roped-in swimming area.

A short distance away from the main park area is a restoration of Old Fort Parker, picturesque log fort and stockade where several Texans were massacred and others taken captive in an attack by Comanche Indians in 1836. Among those captured was Cynthia Ann Parker, aged 9, who was reared by the Comanches, married a noted warrior,

and bore a son who became the greatest Comanche chief.

Moving to the Texas-Louisiana border, the largest fresh water lake in the south is the setting for Caddo Lake State Park, located 15 miles northeast of Marshall. Weirdly beautiful Caddo Lake, with moss-hung cypress, pine, and oak forests in the water, is known as the greatest white perch haunt in the nation. As it also harbors bass, crappie, and bream, it is one of Texas' favorites with lake fishermen. Trees have been cleared from the lake to leave boat channels which appear like roads through a forest, but fishermen unacquainted with the huge lake usually

take a local guide for long boat trips.

Legend shrouds the origin of Caddo Lake. The area is known to have been the hunting ground of the Caddo Indians before the lake was formed, for Indian pottery and weapons have actually been found as far as a mile from shore. Warriors returning from a hunt are said to have found the lake where their village had stood. They called the region "Trembling Ground," and U. S. Geologic Survey Bulletin 494 records the formation of a number of lakes in the same general area as a result of earthquakes in 1811-12. J. G. Burr, aquatic biologist for the Texas Game, Fish, and Oyster Commission, supports the legend and also believes that Caddo Lake was formed by an earthquake which caused the timberlands to sink—hence the ghostly, ancient trees in the water.

The lake's water level has been raised by the erection of a dam, and it now covers a total surface area of about 70,400 acres. It is 20 miles long and has a maximum width of about 16 miles, lying partly in Marion and Harrison Counties, Texas, and partly in Caddo Parish, Louisiana.

The state park's facilities are com-

plete for fishing, camping, picnicking, swimming, hiking, pleasure boating and canoeing. The native stone refectory building is a combined club house and dining room, and log cabins offer comfortable week-end or vacation stays.

Historical Parks Famous

Along with its recreational parks, the eastern half of the state has a number of famous historical parks. Near the Texas coast, on the Houston Ship Channel, is San Jacinto Battleground and Monument. The classic monument, 570 feet high and the nation's tallest, rises over the battleground where General Sam Houston led his revolutionary army to final victory over Mexico, winning independence and freedom for Texas. Markers denoting progress of the battle are situated over the area.

The monument's obelisk is topped with a 35-foot Lone Star, and on the outer sides of its base, carved in Texas limestone, are inscriptions summarizing the events of the Texas revolution. Visitors usually tour the museum in the base and ride elevators to the observation deck high in the tower. Thousands of tourists visit this shrine each year



LONGHORN CAVERN'S "Sam Bass Entrance," top left, is named for the famous outlaw who supposedly used it as a hideout. Inside the cavern, left center, visitors inspect a brilliant rock formation. At lower left, vacationers enjoy a game of golf on the excellent nine-hole course at Bastrop State Park. Below is the dance terrace and refectory building at Fort Parker State Park near Mexia, as seen from a fisherman's boat on Lake Springfield.



and remain to picnic on the shaded tables in surrounding groves of trees.

Battleship Texas Retires

Nearby is the Battleship Texas, which, after serving in two world wars, has found honorable retirement in a slip on the channel at the edge of the battleground.

Another state shrine in East Texas is the home and last resting place of Sam Houston in Huntsville, "the Mount Vernon of Texas." Houston's home and law office have been restored and preserved on their original site near Sam Houston State Teachers College. Huntsville State Park, still in the stages of development, is located on the edge of Sam Houston National Forest.

The home of another Texas hero, Stephen F. Austin, has been developed into a 671-acre State Park on the Brazos River three miles east of Sealy off U. S. Highway 90. The park is the site where Austin settled the first Anglo-American colony in Texas in 1821.

Other state parks in the eastern part of Texas are as follows:

BONHAM: 555 acres, three and one-

half miles southeast of Bonham. Boating, fishing, swimming, dance terrace, picnicking, and playground equipment.

CLEBURNE: Overnight accommodations, boating, fishing, picnicking, swimming, camping. 483 acres, 12 miles southwest of Cleburne on Texas Highway 174.

DAINGERFIELD: 581 acres, two miles southeast of Daingerfield on Texas 49. Boating, fishing, swimming, overnight accommodations, dance terrace, camping, picnicking, and playground equipment.

GOOSE ISLAND: 157 acres on Copano Bay, 12 miles northeast of Rockport on Texas 35. Boating, sea fishing, camping, and picnicking. Giant oak, whose branches spread over 6,000 square feet of ground.

JIM HOGG: Park under construction; the home of Governor Hogg. 177 acres, two miles northeast of Rusk off U. S. 84.

LAKE CORPUS CHRISTI: 14,111 acres on Nueces River, four miles southwest of Mathis on U. S. 59. Boating, fishing, camping, swimming, picnicking, and dance terrace.

MERIDIAN: 468 acres in the Bosque

Valley, three miles southwest of Meridian on Texas 22. Boating, camping, fishing, fishermen's barracks, picnicking, and dance terrace.

MOTHER NEFF: 256 acres on Leon River, eight miles southwest of McGregor. Oldest of Texas State Parks. Stone pavilion or auditorium, refectory, picnicking, camping and fishing.

NORMANGEE: 500 acres, six miles west of Normangee. Boating, fishing, camping, cabin area, and picnicking. (Formerly a state park, now a city park.)

TYLER: 985 acres, ten miles north of Tyler. Boating, fishing, cabin area, swimming, picnicking, dance terrace, and playground equipment.

STATE PARKS OFFER historical interest as well as recreation. Stephen F. Austin Park, where statue at right appears, is the site of the first Anglo-American colony in Texas. Sam Houston's home and law office have been restored at Huntsville, right center. At lower right is the refectory building at Caddo Lake State Park, a favorite gathering place for fishermen. Below is an aerial view of San Jacinto Monument and the old Battleship Texas.





BIG TRANSPORT TRUCKS deliver gasoline directly from terminal loading racks to retail stations in cities and towns. Dumps of 4,600 gallons or more are made into large underground storage tanks, minimizing safety hazards by reducing public contacts at delivery times.

Bringing Baytown Refinery to Texas Motorists

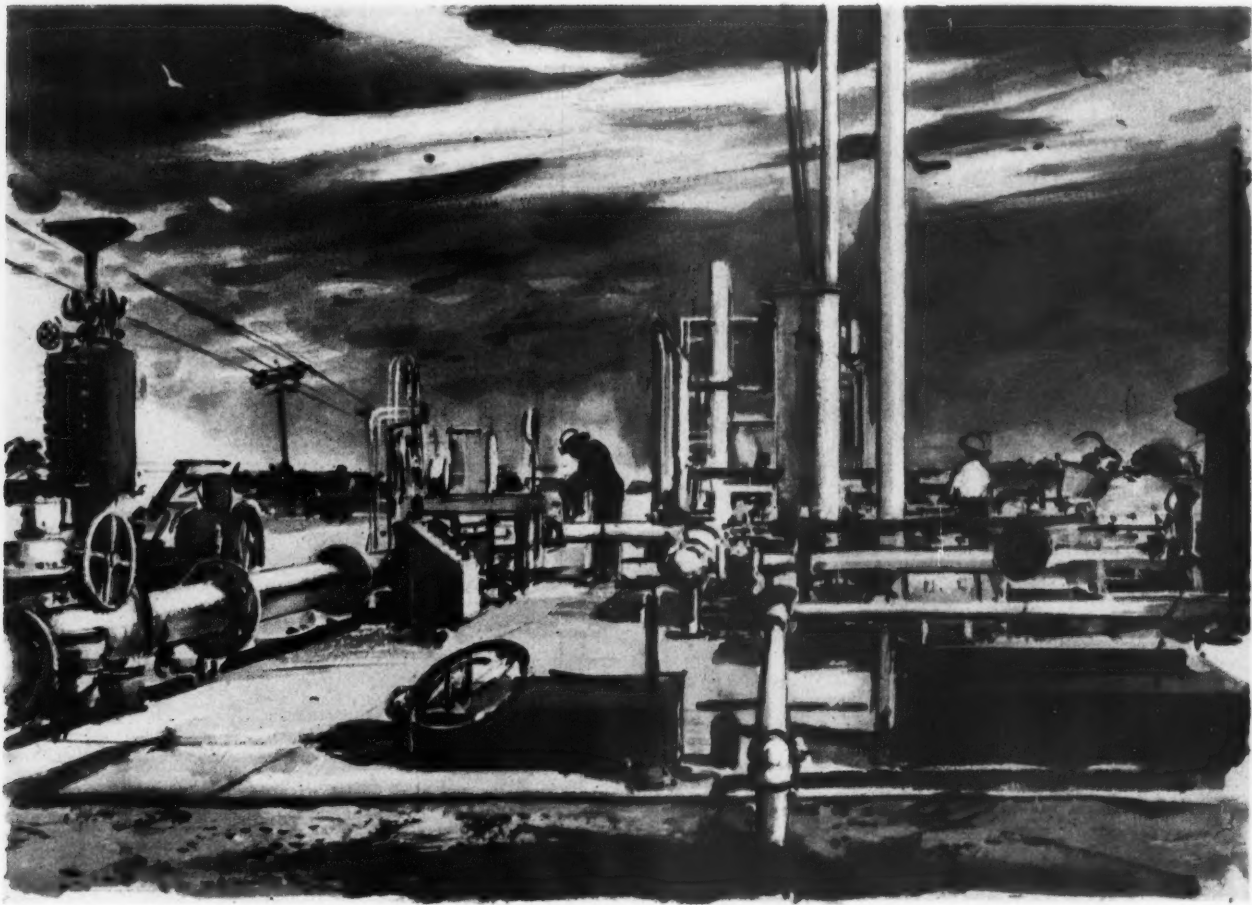
Gasoline pipe lines, pumping large quantities of motor fuels from coastal refineries to inland terminals for widespread distribution through wholesale and retail marketing channels, are largely a post-war development.

Humble Pipe Line Company completed the first major intrastate line of this kind in Texas late in 1945. In the short span of three years this 276-mile line from Baytown to north Texas has come to play a vital role in Humble's growing marketing operations.

In the watercolor paintings on these pages and on the front cover, Artist E. M. Schiwetz has recorded the phases of this line's operations which impressed him on a recent tour; the simple beauty of modern pump stations; the attractive patterns of lines and storage tanks and automatic equipment at terminals; and the fast and safe methods of truck distribution from terminals to service stations conveniently located on main thoroughfares in cities, towns, and hamlets over the state.



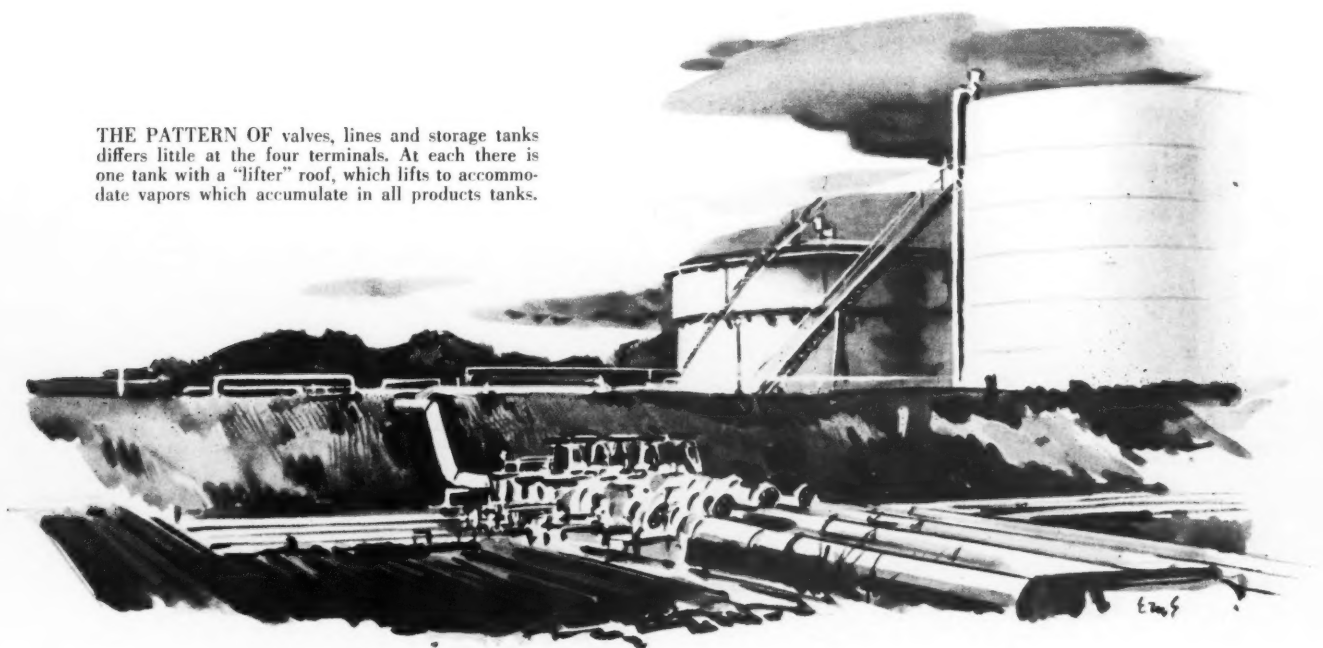
PUMP STATIONS AT Baytown and Hearne are attractive, modern structures. Brick, glass, and stone are combined in a design which makes the stations look more like small schools or business buildings than pipe line stations; completion of landscaping program will add to their beauty.



AUTOMATIC EQUIPMENT in and around pump stations and terminals enables small crews of experienced pipe line operators to handle

the movement of some 400,000 gallons of aviation gasoline and automotive fuel daily. Line is now moving amount anticipated for 1951.

THE PATTERN OF valves, lines and storage tanks differs little at the four terminals. At each there is one tank with a "lifter" roof, which lifts to accommodate vapors which accumulate in all products tanks.





AFTER A CROSS-COUNTRY PIPE LINE JOURNEY, GASOLINE IS LOADED ON TANK TRUCKS FOR WIDESPREAD DISTRIBUTION

Esso Extra Goes to Market

... via pipe line and tank truck

In the competitive race for customers, manufacturers are under pressure to find ways of making better products at the lowest cost. Frequently, the solution of the manufacturer's problem is found in mass production at large plants—as in the case of automobiles and petroleum products. But that solution poses another problem of devising low cost methods of distribution so that the economies of mass production will not be offset by transportation and handling charges.

The petroleum industry has organized its own system of transportation of raw materials and finished products by pipe lines, tankers, barges, tank cars, and tank trucks to distribute products at low cost from the large refineries that can make the best quality products. In the marketing of gasoline, pipe lines have become especially important as a

means of controlling distribution costs within the past 10 years. For that reason, Esso Extra now goes to market throughout a large part of the State of Texas by means of an 8-inch products pipe line from the Baytown refinery on the Gulf Coast to the Irving Terminal in the Dallas-Fort Worth area. Construction of that line made it possible to market competitively the high quality Esso Extra gasoline made at Humble's Baytown refinery. The special equipment and techniques used in making Esso Extra would be prohibitively expensive except in the processing of huge quantities of petroleum products. To market such a volume of products advantageously from Texas means that the larger refineries must be located on the Gulf Coast so that they can reach the great

markets of the Atlantic Seaboard by the use of tankers. To provide the lowest cost transportation from the Gulf Coast to the interior of Texas required the construction of pipe lines. For that reason, Humble built its products pipe line immediately after the war into North Texas.

The products pipe line constructed by Humble Pipe Line Company in 1946 was the first intrastate products pipe line of consequential length constructed in Texas. This line made it possible to move products from the Baytown refinery to communities in many sections of the state where Humble had not previously been able to compete successfully. The pipe line solved one of Humble's most pressing problems as a marketer of motor fuels in Texas and

made it possible to supply dealers in many towns where Humble gasolines had not been available before.

The construction of the pipe line has already been described. (THE HUMBLE WAY, May-June, 1946). It was an old story to the Humble Pipe Line Company; laying the line offered no serious challenge to the ingenuity of experienced engineers. The only important question was what size line to build. The estimates of the amount of products to be moved first indicated that a 4-inch line would suffice, but these estimates were revised upward so rapidly that the pipe line engineers finally decided to build an 8-inch line all the way from Baytown to Irving.

The line is 276 miles long, with pumping stations at Baytown and Hearne, and with five terminals; Baytown, North Houston, Hearne, Waco and Irving. The pipe line facilities are owned and operated by Humble Pipe Line Company, a common carrier; the terminals are owned and operated by the Sales Department of Humble Oil and Refining Company.

Both pumping stations are equipped with electrically powered centrifugal pumps—three units at Baytown, two at Hearne. Innovations in the pumping stations include thermocouples with recording pyrometer units to record temperatures at several points on each pumping unit. If these temperatures become critical, the unit shuts down automatically. Electrical circuits, insofar as practicable, have been wired as "explosion proof," to provide a maximum of safety and a minimum of "down time." By exhausting hazardous vapors the pump room is kept under a slight vacuum; conversely, there is a slight pressure in the control room. All switches are designed for safety—they are enclosed in special devices to prevent any slight danger from sparking. Valves—in the pump room and on the valve and meter slab—are motor operated; pumps are automatically vented.

The control board in the control room is a device to amaze the layman. The various electrical circuits that control pumps and valves and other equipment, a veritable maze of wiring, reach a climax of simplicity on the control board. It schematically reproduces the plan of the station's lines, pumping units and tanks, with "start" and "stop" push buttons for each unit. Closed valves are indicated by an illuminated "C," the flow of products by illuminated arrows.

The engineer on duty pushes a "start" button. This activates a circuit which: (1) opens a valve from the line to the pump, (2) starts the pump motor, and (3) opens a discharge valve. At the same time, a solenoid valve in the air line to the automatic venting system closes the automatic vent. This entire chain of events results from the pressure of one finger on a single button!

At every station, there is a valve and meter platform. On this are located the various valves which control the flow of products to the Sales Department's tanks, the meters which register the flow, filters, and a meter calibrating tank. The meters are tested and calibrated at regular intervals to assure an accuracy of 5 barrels in 10,000, or 1/20 of one percent.

Operation of the line poses no extra-

ordinary problems to the Pipe Line Company. Special safety precautions are taken because of the flammability of the products handled, as, for example, cadmium plating the tops of frequently removed filter tanks to prevent sparks. Internal corrosion of the line is guarded against by injection of an inhibitor. This is subsequently removed as the product passes through a tank known as a "hay tank," or filter.

The line is always full and may contain in its length several grades of motor gasoline and of aviation fuel. You would think that there might be some risk of mixing these products, but the pipe liners say that keeping the flow turbulent prevents the formation of a current at the center of the pipe which would allow the different batches of products to mix together. Moreover,



HUMBLE PIPE LINE Company fills terminal storage tanks just as stations fill auto tanks—by quantity. Meters measure amount; proving tank, above, is used to check meters' accuracy.

special marking dyes are introduced to indicate visually the separation of different products, and as an added precaution, specific gravities of samples are taken. Finally, when a product follows another of lower grade, enough of the high-grade product is down-graded to assure the purity of the better product in the terminal tanks. Repeated tests indicate that there is no mixing of products.

The gasoline pumps as easily as water, or even with a little greater ease, and at higher pressures than the average crude oil. Already the line is moving about 400,000 gallons daily, or as large a volume as had been anticipated for 1951.

All the Sales Department Terminals follow generally the same pattern of organization and operation. A dispatcher is in charge, with a crew of drivers for the big transport trucks that haul gasoline from the terminal to service stations and wholesale plants. Company owned trucks are supplemented by contract haulers; the company trucks rarely operate over greater distances than 80 miles; the contract trucks travel much greater distances—one contract hauler delivers Esso Extra gasoline at Wink, more than 400 miles from the Terminal at Waco. The Baytown Terminal delivers kerosene, Humble Motor Fuel, Esso Extra, and two grades of aviation gasoline; deliveries from the other terminals are limited to the two motor fuels and aviation gasolines.

Except at Baytown, where delivery to the Terminal is direct from the refinery, the Terminals look much alike and have similar facilities. In a large, fenced yard there is a building containing an office,

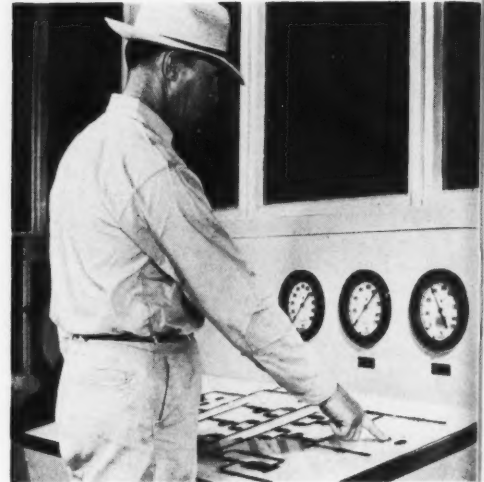
a storeroom and a garage. Around this building is a paved area and directly in front of the building is a truck loading rack. At all the terminals except Houston a tank car loading rack is also available. The tank-car racks are rarely employed these days, as tank cars are needed more in service elsewhere.

The truck-loading rack is longer than most of those you see, and specially designed to fill the big transports in a minimum of time with loads of 4600 gallons of gasoline or more. The rack is equipped with accurate meters, retractable walkways, and an enclosed "dog house" for the operator when the weather is bad. The walkway down the length of the rack is protected from the weather by two shields extending downward from the roof. Grounds are now being landscaped and at every terminal you find the men watching the progress of the grass with the impatience of a new home-owner. A "smoking shack," a safe distance away from all operations, is provided at each terminal.

The terminals' tanks are recognizable by the one tank with a "lifter" roof. The best way to describe this is to ask you to look at the schematic sketch which accompanies this article. It is the recovery tank for the vapors which accumulate in the other tanks of the terminal; they are vented to the "lifter" tank, the roof of which lifts to accommodate the vapors of all the tanks.

Baytown Terminal has two 80,000 barrel tanks and two of 40,000 barrel capacity. From it, trucks deliver motor and aviation gasolines principally in the area around and between Baytown, Galveston and Beaumont.

Houston Terminal has one 10,000-



FLOW OF GASOLINE through pipe line station is controlled by push buttons.

barrel tank and three which will hold 30,000 barrels each. Humble trucks operate from here as far as Lufkin, Huntsville, Schulenberg, La Grange, Brenham, Bay City and Edna, and contract haulers deliver Esso Extra as far as Luling and Lockhart.

At Hearne Terminal, there are two 30,000 barrel tanks and one 55,000 barrel tank. Trucks from this terminal cover a broad territory, east as far as Longview and west as far as Fredericksburg, including Austin.

The Waco Terminal has two 24,000 barrel tanks. Its trucks range from Tyler on the east to Wink on the west, though the long trips westward are only for the purpose of delivering Esso Extra.

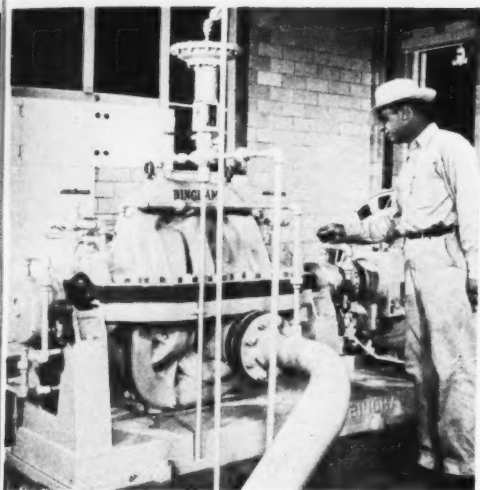
The Irving Terminal has one 55,000

PRODUCTS PIPE LINE to North Texas originates at the Baytown Terminal near Humble's refinery. Pump station is seen at far left.



AT NORTH HOUSTON Terminal loading racks, foreground, big tank trucks receive gasoline for the Lufkin-Huntsville-Brenham area.





ENGINEER INSPECTS automatically operated pump at products pipe line station.

barrel tank and three of 30,000 barrel capacity. This terminal supplies the busy Dallas-Fort Worth area and the region north of it into which the Company is expanding its marketing operations. Its service area includes such important cities and towns as Wichita Falls, Abilene, Clarksville, Gainesville, Sherman, and Denison.

At all the terminals, the day begins early and lasts late. Accurately, it is a 16-hour day, with two shifts. In the office, a careful record is kept of the requirements of bulk and service stations, and the day's runs are planned as far in advance as possible, with due allowance for unforeseen shortages. Terminal dispatchers pretty well know on Monday most of the deliveries they will make on.

say, Wednesday, a good number of those to be made on Thursday, and a few they'll make on Friday. This knowledge derives from accurate records plus an experienced knowledge. Demand fluctuates with the season, of course, and with special events. On the Fridays before a big football game at Austin, trucks from Hearne fill all the stations and then refill them on the Sunday following. Service stations on tourist traveled highways must be supplied more frequently during the summer months.

The drivers, for the most part, "double in brass" by driving trucks, working on the loading rack, and doing truck maintenance work in the garage. There are usually three men assigned for each company-owned truck and the shifts of duty are equitably divided among them.

It all makes for a pretty busy day. At Irving Terminal, for example, as many as 60 or 70 transports may be loaded out in a single day; call it 64, and you have a truck loaded with nearly 5000 gallons of gasoline leaving the terminal every quarter-hour of a 16-hour operation.

But this story of improved distribution facilities doesn't end at the Sales Department Terminals on the pipe lines. The idea is to bring the quality products of Baytown refinery right to the user's car, and this takes place on service station driveways. And so, as Humble Pipe Line Company began construction of the products pipe line, the Sales Department began the installation of large capacity tanks at retail outlets.

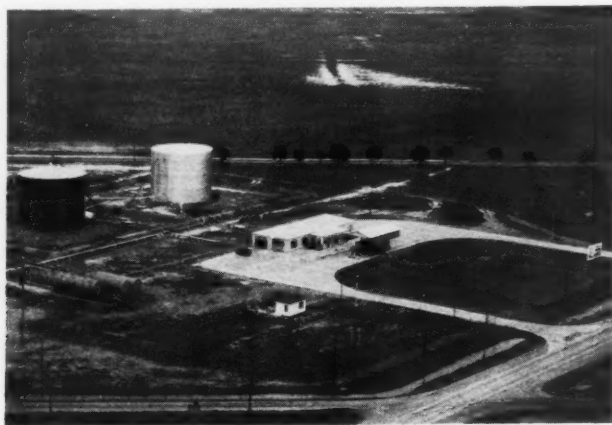
The transport truck, loaded with some 4600 gallons of gasoline, leaves the terminal for a specific destination. There are no time-consuming wayside stops.

no deliveries of 100 gallons or 500 gallons or even 1000 gallons, all involving time, some suspension of service at the retail outlet, multiplied paper work and public contacts affecting safety. The transport truck arrives at one station, dumps all its load in a half-hour, handles the entire transaction on one form, and gets off the busy station's driveway, to stay off for two or three days, perhaps a week. And back it rolls to the terminal for another load for another station. The savings in accounting work are in proportion to the size of each delivery, and the reduction of public contacts at delivery times greatly increases the safety of handling gasoline.

Bulk stations are supplied, like the service stations with large storage capacity, by transport trucks from the terminals; and retail outlets whose gallonage does not justify the larger storage capacity are still served by bulk station trucks, which are just as busy as they ever were. The continuing usefulness of the bulk station in the distribution of petroleum products has been amply demonstrated not only in this capacity but in the service rendered to industries, farmers, and to all retail outlets in the handling of the numerous Humble products which are not shipped by pipe line.

Thus the quality products of Baytown refinery are made available to users in many parts of Texas—thus Esso Extra goes to market. And the motorists of North Texas, East Texas, and a major portion of West Texas can enjoy the benefits of Esso Extra's "extra performance" as though they lived within sight of Baytown refinery itself.

FROM WACO TERMINAL, below, trucks range from Tyler on the east to Wink on the west. Railroad tank cars may also be loaded here.



IRVING TERMINAL, located between Dallas and Fort Worth, is the end of the line, serving the North and West Central areas of Texas.





NEW DOCK at right, built at Baytown for the Crude Oil Department, will be big enough to accommodate two of the largest tankers now afloat and even bigger tankers planned or under construction. From this new dock in Houston ship channel will go still more oil to the nation's markets.

NEW DOCK AT BAYTOWN

A NEW concrete dock is being constructed at Baytown to load crude oil on tankers. Dock No. 5 is another part of Humble's large program of investment to handle the increasing volume of oil required to meet consumer demands. It is located near the other docks at Baytown which load both refined products and crude oil on tankers.

The new dock will be 42 feet wide and 400 feet long. It will accommodate on either side the largest tankers now afloat as well as larger vessels already on order and under construction. The average tanker now in operation carries about 125,000 barrels of oil, but the new larger tankers will carry 225,000 barrels. (Each barrel contains 42 gallons of oil.)

To expedite loading of the tankers

at the new dock, four large new storage tanks are being built on shore, each with sufficient capacity to supply the entire load for one T-2 type tanker. Pipes are being laid from the tanks to the dock and pumps will be installed capable of loading the oil at high speed so that it may move rapidly on its voyage to the ultimate consumer. These facilities will be completed early in the fall of 1948.

If the dock were located where many people passed, its construction would attract a lot of "sidewalk superintendents." The steel substructure which was erected first made a picture of precise geometric patterns. Currently, the concrete is being poured. A small flat boat moves buckets full of concrete from the mixer on shore to the structure. As the flat boat comes alongside the dock

structure, a huge crane mounted on a barge picks up the full buckets and swings them to the deck for pouring.

The activity of the contractors' crews and equipment makes quite a contrast with the effortless flight of the gulls as they soar around the bay on a bright, calm summer day. These aerial spectators do not pay much attention to the industrial progress going on beneath them, being more concerned with their constant search for some morsel of food, for which they plunge down occasionally in a precipitous dive.

The new dock is taking shape rapidly. Before many weeks are over the contractors will have completed their work and the Crude Oil Department will begin loading tankers at this dock on Mitchell Bay within sight of the Baytown refinery.

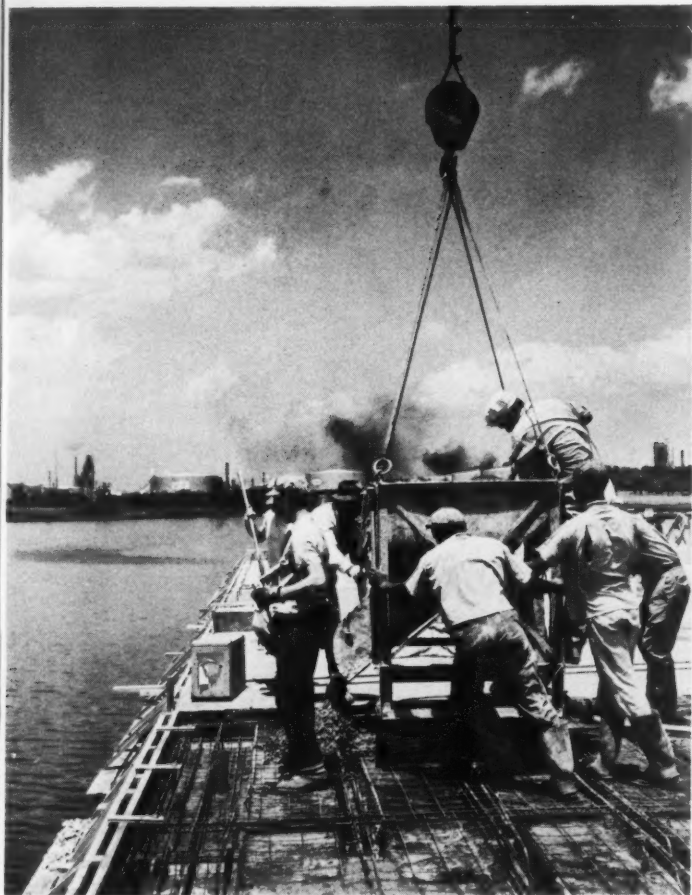


DOCK NO. 5 juts forward toward the ship channel in a position some 400 feet west of and parallel to Dock No. 2. Located in Mitchell

Bay, across from Baytown refinery, the new dock is built of structural steel with a concrete deck. It will be 42 feet wide and 400 feet long.

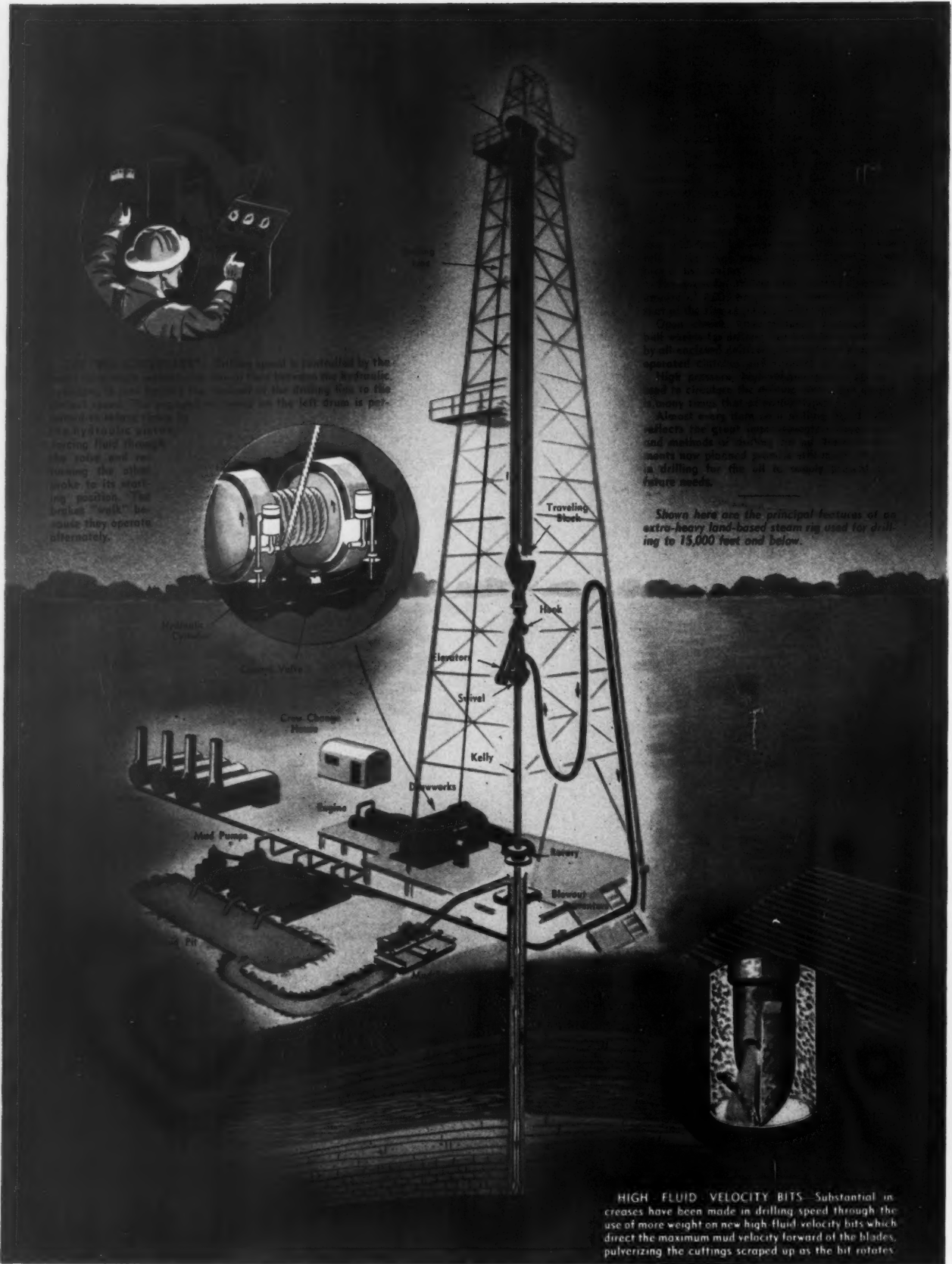
Construction Scenes

POURING CONCRETE from a bucket lifted to the dock's deck by a large crane mounted on barge alongside. Baytown refinery in background.



STURDY FLATBOAT chugs busily between dock structure and shore, delivering bucketsful of concrete and returning to mixer for refills. Workmen (below) smooth out concrete after it is poured on the deck.





Drilling speed is controlled by the hydraulic system which transmits the hydraulic pressure to the drums of the drilling line to the control valves. The pressure on the left drum is permitted to release fluid to the hydraulic system forcing fluid through the valve and returning the other valve to its working position. The brakes "walk" because they operate alternately.

Shows here are the principal features of an extra-heavy land-based steam rig used for drilling to 15,000 feet and below.

HIGH FLUID VELOCITY BITS—Substantial increases have been made in drilling speed through the use of more weight on new high fluid velocity bits which direct the maximum mud velocity forward of the blades, pulverizing the cuttings scraped up as the bit rotates.

Super Rig at Sugar Valley

SURROUNDED on four sides by tall trees and dense underbrush, one would never guess the name of the place—Sugar Valley. Few places have been so inaptly named, for it is neither a valley nor a sugar field. In earlier days sugar was grown near this spot between West Columbia and Bay City, Texas, but the exact origin of the name has been lost.

Sugar Valley is known for other reasons. One is that it is an oil field and a good one. Eight oil and three gas producing zones nearly 10,000 feet down have been sufficiently inviting for oil men to build roads and production facilities while drilling nearly 80 wells. The massive stumps and tree trunks thrust aside by the road builders testify to the hardships of constructing the smooth shell drives which now lace the field. Today workmen are busily erecting a Humble field community near the highway, beyond the wooded bottom land.

Sugar Valley's most recent claim to fame is due to its outstanding occupant—Humble's Rig No. 30. Tucked away in the tall trees around a bend in the road, Rig 30 appears to be just another drilling rig chugging away as it spins a drilling bit thousands of feet below.

But Rig 30 is no ordinary rig. To begin with, it is an extra-heavy rig for

If some of the words in this article are new to you, you'll want to know that . . .

roughnecks in oil language are members of the drilling crew;

a *round trip* means the bottom of the drill pipe makes a round trip to the surface and returns, the drill pipe being pulled out in 90-foot sections or *stands* or *thribbles*, meaning three joints of drill pipe connected together; the *derrickman* is the drilling crewman who racks the upper end of the drill pipe stands while working on the

monkey board, the derrickman's perch 90-feet above the derrick floor;

rotary helper is the time-sheet designation for the crewmen who work on the derrick floor during round trips and handle the

tongs, the giant wrenches used to screw up the drill pipe; regular tongs weigh nearly 400 pounds each;

slips wedge the pipe in the rotary table when the drill pipe in the hole is not supported by the

elevators, the clamps which grip the stands to pull the pipe out of the hole;

a *tour* is a crew's regular eight-hour shift;

the *spinning chain* is a chain used to spin the stands while screwing them up;

a *blowout* results when subsurface pressures get out of control.

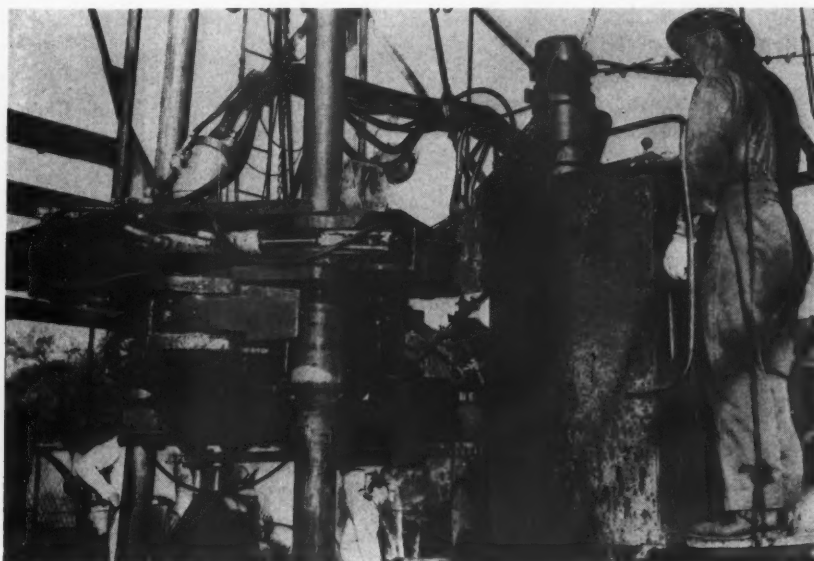
drilling deep holes. More important today, however, it is Humble's "laboratory" drilling rig, equipped with some new machines for automatic drilling that are a big step toward making *roughnecks* white-collar workers.

More than three years of research in drilling problems by Humble's Petroleum Engineering division has produced new equipment that makes old timers shake their heads in awe. The way 10,-

000 feet of drill pipe can be pulled out, stacked in the derrick, and run back in the hole with no physical exertion by the crew amazes anyone familiar with drilling for oil.

Just a few hundred feet from Rig 30, on another rig, a *round trip* the "regular" way requires skillful coordination of sweating crewmen and heavy machinery. Drilling is definitely easier using the 30 new items of equipment being

NEW AND OLD ways to "stab" a stand of drill pipe when going in the hole; strain of the man below and the spinning chain have been replaced by smooth operation of the remote control power tongs and pipe-racker at right.



tested on Rig 30, 12 of which are radically new to drilling rigs.

Watching a 90-foot long *stand* of drill pipe being unscrewed and racked in the derrick untouched by hand leaves most visitors spellbound. The entire operation requires just a few motions by the drilling crew, and the *derrickman* doesn't lift a hand. He sits on his traveling *monkey board* 90 feet above the derrick floor and controls the upper racking arm by a single control handle similar to an aircraft "joy-stick."

Those accustomed to the weight and bulk of machinery for drilling deep holes are surprised to see two small electrically-operated steel arms move 2,000-pound stands of drill pipe with ease and dexterity. Just as interesting are the power *tongs* with the grip and strength of a giant which unscrew and screw up drill pipe connections with equal ease. The hydraulic-powered tongs are remotely-controlled by a *rotary helper* who also controls the movement of the lower racking arm.

The cold blasts which will probably strike Rig 30 this winter will not bother the derrickman. He'll be seated inside the cozy lucite enclosure now planned, complete with warm air. That, the men in the field say, will be something! Such a canopy can be used, as the derrickman has no need to reach outside during regular round trips.

All the new equipment is operated by the regular five-man crews. No special

training was necessary; they mastered its operation quickly.

The development of these spectacular machines began in 1945, when Humble's Petroleum Engineering Division launched a research project seeking to improve the methods of drilling deeper for oil. The tremendous demand for oil during the war had already caused the oil industry to drill deeper to supply our armed forces and maintain adequate reserves. The extremely high cost of drilling below 7,000 feet demanded equipment vastly more efficient. Engineers concluded that automatic equipment to speed up drilling and relieve crews of many of the tedious repetitive jobs was necessary for the development of any drilling program reaching much below 10,000 feet. Casting a glance to the future, when oil may be sought four miles down, further emphasized the importance of automatic equipment.

Round trips, of course, are the most tiring jobs on a drilling rig. They are the most costly, too, as drilling ceases while the drill pipe is pulled out to replace a dull bit. In fact, from 10,000 feet on down, more time is consumed changing bits than drilling. This is because the harder formations found at those depths wear bits out faster, and because longer round trips require more time. The heavy equipment on today's larger rigs tires men out when a trip takes a full *tour* and more to complete.

Although the actual speed of pulling

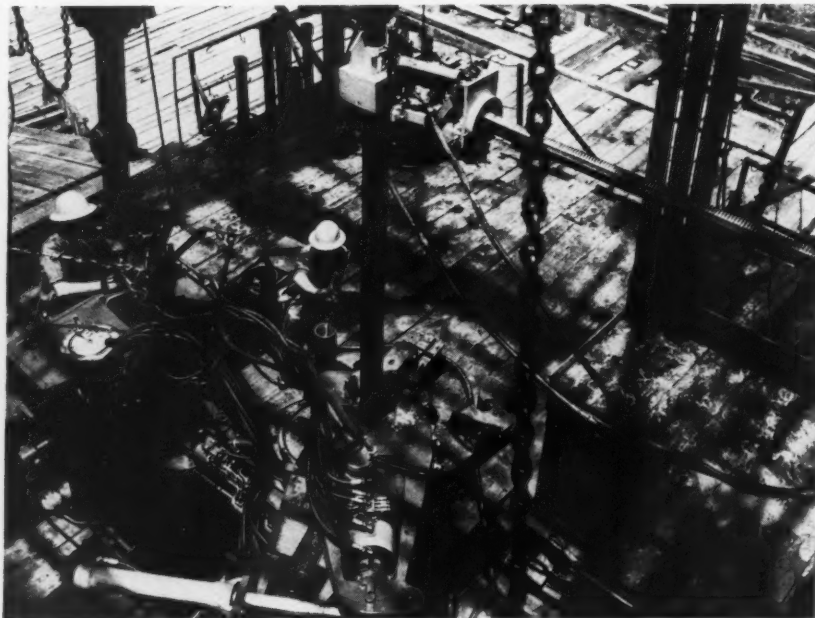
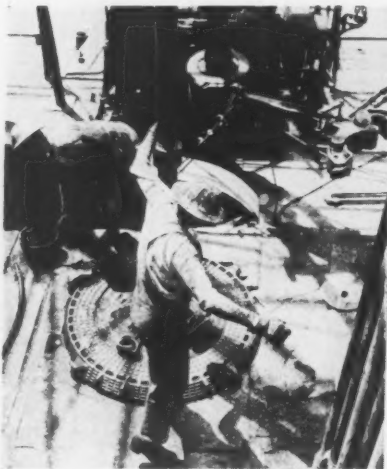
the pipe out of the hole can't be materially increased due to the danger of upsetting the mud column and virtually inviting a *blowout*, Humble engineers believe that reducing the fatigue of the drilling crew will both increase their efficiency and safety. With automatic equipment, crews can concern themselves with the overall operation of the rig rather than lend physical assistance to it. Some time will be saved as the men study the performance of the machinery and not merely perform with it.

A California man with long experience in designing drilling machinery began the job of developing the automatic equipment just a few days after Japan's surrender. No designs for machines to rack pipe in the derrick had until then stood the initial tests of oil field equipment: ruggedness, portability, and ability to save time or money.

A model derrick nine feet high was constructed to try out the first designs. After eliminating a few "bugs," the first full-size racking equipment was installed on a manufacturers' test rig to try out its operation with the power tongs. In present form, the remote control pipe-racker and power tongs are a joint development of Humble, an independent consultant, and a leading equipment manufacturer.

The equipment has been in operation on Rig 30 since April of this year, and has fulfilled previous expectations while drilling two wells to 10,000 feet. A

NEW AND OLD methods of racking drill pipe: lower racking arm (right, center) lifts a stand from the power tongs before racking the stand on the elevated pipe platform. Tong and racker operation are controlled by the man at left, other man washes drill pipe.





DERRICKMEN have long been accustomed to leaning far off the monkey board to steady the drill pipe as it is screwed up. NOW THE derrickman can rack many thousands of feet of drill pipe with no effort save tilting the control handle in his hand.

new and improved model of both units is now being designed.

Round trips are easy with remote control equipment. After a stand has been pulled up into the derrick, and the hydraulic *slips* operated by the driller support the pipe in the hole, the tong operator and derrickman take over. From his seat at the control panel the tong operator pushes the eight controls as the hydraulic-powered tongs swing around and unscrew the stand of pipe in the derrick and "hand" it to the lower racking arm, which racks the stand on a special platform five feet above the derrick floor. At the same time the derrickman releases the *elevators* and controls the upper racking arm as it racks the upper end of the stand simultaneously with the lower end. The weight of the stand is supported at the lower end by a line from the derrick. The fourth man on the crew merely stands at the rotary, washes the drill pipe, and latches the descending elevators around the next stand.

Going in the hole, the procedure is reversed. The lower racking arm picks up a stand and "hands" it to the power tongs which swing around and screw up the connection. A hydraulic motor atop

the tongs replaces the old *spinning chain* for spinning the pipe up, and a large hydraulic cylinder applies the squeeze for tightening or loosening the connections. The sequence of operations is slightly changed from the old method, as the automatically-latching elevators are run up and stopped just above the derrickman to allow the upper racking arm to push the stand into them.

New hydraulic slips, actuated by the driller's electric switch, are used in conjunction with the remote-control tongs.

The speed of racking one stand with the remote-control pipe-racker and power tongs is approximately the same as that possible with conventional hand operation, but the advantage of the new equipment is that this speed can be maintained indefinitely, whereas fatigue will slow crews working by hand during long trips. The automatic equipment reduces hard work and enables old and experienced crew members to remain active longer. Safety is greatly increased, since there is no fast-moving machinery to become entangled in.

Humble engineers didn't stop with merely improving round trip efficiency. Another phase of the research program

carried out in cooperation with a second consultant included developing an automatic control which would increase drilling speed.

The new automatic drilling control recently installed on Rig 30 keeps the bit digging its fastest by maintaining uniform weight or pressure on the drill bit in all formations. This of course relieves the driller of manually attempting to keep the weight constant. Normally he feeds off the drilling line to increase the weight on the bit by slipping the brakes, which results in either too much or too little weight on the bit most of the time, depending on the skill of the driller. At the very best, hand operation is irregular and increasingly difficult as the drill string becomes longer and heavier. Automatic control keeps the bit drilling at its most efficient rate, and helps to avoid twisting off the drill pipe.

In deep drilling, where long strings of pipe are less sensitive to the feel of the driller, automatic control is especially important. Ten thousand feet of drill pipe will wind up nearly eight times in the rotary before the bottom end turns, and will stretch about five

feet due to its own weight.

The new automatic drilling control on Rig 30 uses the sensitive signal from an electronic weight indicator to maintain the driller's desired weight on the bit. That signal is converted into the controlling action which regulates the rate of feed-off of the drilling line.

Humble-developed "walking feed-off" air brakes do this job on Rig 30, although the new control is adaptable to any type feed-off device. Walking feed-off brakes get their name from the alternate action of the two air brakes on the drawworks drum. In operation, one brake engages and rotates partway with the drum, the speed of rotation and feed-off determined by a hydraulic piston. The drilling control regulates the flow of hydraulic fluid forced out by the piston, thereby controlling the rate of feed-off. The hy-

draulic system is closed, and the fluid returns the other brake to take another "step" as the drum rotates. The brakes are engaged simultaneously by air during round trips.

Perhaps the most outstanding contributions to drilling speed in recent years are the new techniques and bits developed by Humble engineers after five years of research. Drilling time in the Gulf Coast area has been cut in half by the use of the new bits. The bits more than double previous drilling speed, which means a saving of about 21 days on a 9,000-foot well. Some idea of the importance of this development may be gained from the fact that an extra-heavy rig costs up to \$1,500 per day to operate. The results of this research have been made available to the entire oil industry.

The new bits are designed to direct

the maximum mud velocity on the cuttings in front of the blades. Using a predetermined rate of circulation, the "jet" effect of the mud from the nozzles permits the driller to place up to 40,000 pounds on the bit, almost twice the weight possible with drag bits before.

Many formations formerly drilled with rock bits are now penetrated with high-fluid-velocity bits. A 1,500 foot section of the Sugar Valley field drilled by Rig 30 provides an interesting comparison. In the section from 8,200 to 9,700 feet it required eight high-fluid-velocity bits to drill the section formerly drilled with 10 rock bits and 5 regular drag bits. The new bits drilled twice as far, eliminating many round trips, and two-to-three times as fast as other bits.

The use of high-fluid-velocity bits has been extended to all Humble rigs in drag bit areas, and has provided an important boost to carrying out the extensive drilling program planned for this year. Research in the factors affecting drilling rates continues as the high-fluid-velocity principle is applied to rock bits, and to drag bits in other areas.

Much of the drilling research has been assisted by the use of a drilling rate meter which records the rate of penetration of the drilling bit in feet per hour. This provides an accurate record of drilling speed for comparative purposes, and assists geologists in analyzing the formations far below.

Notable among other improvements on Rig 30 are the pneumatic throttles which provide finger-tip control of the hoisting engine, mud pumps, and rotary speed governor.

The newest item of equipment placed on test on Rig 30 is a mud mixer which speeds the addition of dry mud materials into the drilling mud. The mud mixer, driven by a 10-horsepower turbine, replaces a 175-horsepower pump formerly used to circulate mud in the pit through the nozzles of mud "guns."

The importance of automatic machinery increases with depth of the hole, primarily because formations are harder, the drill pipe is under increasingly greater stresses, and the more-frequent round trips are longer. Heavier equipment for deep drilling calls for more accurate control than is possible by hand.

Humble engineers are delving deeper into drilling problems, seeking ways to speed all drilling and thereby make it practical to seek oil at greater depths.



DUMPING DRY mud materials into the new mud mixer is fast and easy; steam turbine-driven propellers in the mixer and on the bottom of the pit keep the mud constantly agitated.





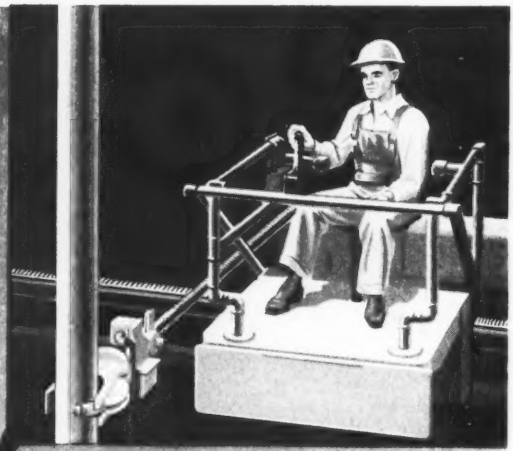
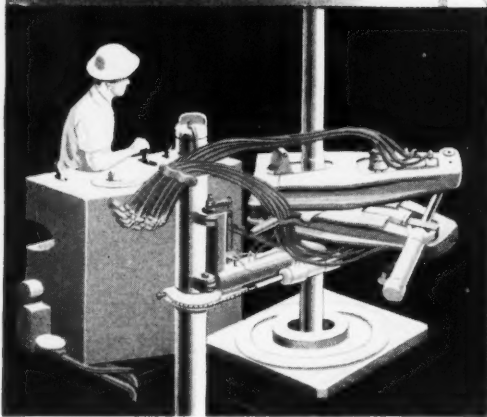
Round Trip by Remote Control

Humble's new electric pipe-racker and hydraulic-powered tongs have reduced the sweat and strain of round trips by pushing a few valves and switches. When the bit is dull and the 70-foot long stands of drill pipe are pulled out of the hole, the hydraulic tongs quickly unscrew the stands and "hand" them to the racking arms for racking on the special pipe platform.

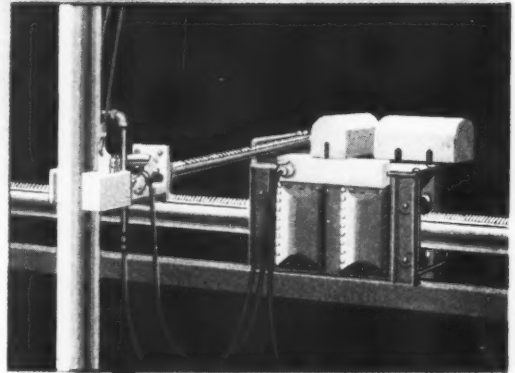
Rotary drilling has indeed progressed from the small derricks where a few thousand feet of small-diameter pipe was racked by hand. On today's largest rigs many thousands of feet of five-inch drill pipe is racked by hand in stands up to 120 feet long, but now remote-control operation of these jobs will make possible still deeper drilling to find the oil so much in need today.

The racking arms are shown here "handing" a stand of drill pipe to the power tongs while going in the hole. This intermediate position makes it possible for the stand to be held clear of the traveling block as it descends. The elevators will be lowered and the upper end of the stand pushed into them as the tongs swing over the rotary and screw up the connection.

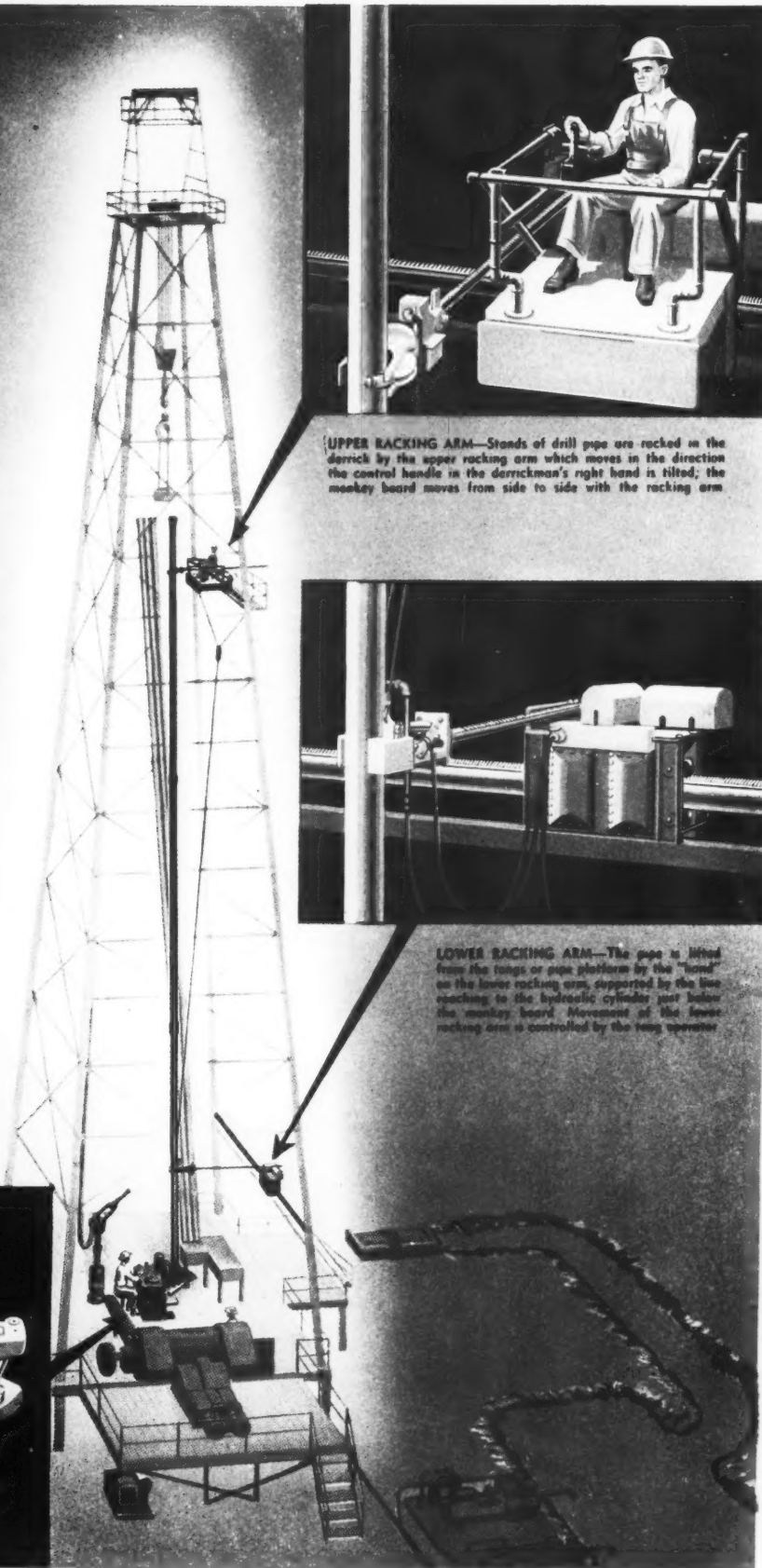
HYDRAULIC POWER TONGS—Drill pipe and casing from 2 inches to 5 inches in diameter is tightened and loosened by the power tongs operated by the derrickman seated at the long control panel.



UPPER RACKING ARM—Stands of drill pipe are racked in the derrick by the upper racking arm which moves in the direction the control handle in the derrickman's right hand is tilted; the monkey board moves from side to side with the racking arm.



LOWER RACKING ARM—The pipe is lifted from the tongs or pipe platform by the "hand" on the lower racking arm, supported by the line racking to the hydraulic cylinder just below the monkey board. Movement of the lower racking arm is controlled by the tong operator.



By the way . . .

Producer in the Gulf

Humble Oil & Refining Company's Grand Isle State Lease 1-A, eight miles out in the Gulf of Mexico off Grand Isle, Louisiana, was completed on August 15 as a substantial oil well. It flowed at an average rate of 877.92 barrels a day on a test.

The big \$1,200,000 platform and rig had received considerable attention in newspapers and trade journals in recent months. The first hole drilled from the platform encountered salt without finding a pay sand of commercial value. It was plugged back and a directional hole was drilled to a total depth of 8,951 feet. Oil production is from 8,640-65 feet, and completion of the well marks the opening of what appears to be a major oil field in the Gulf of Mexico.

New Research Laboratory

Construction will be started in September on a new central research laboratory at Humble's Baytown refinery, it was announced early in August. Most research activities at Baytown will be consolidated in the new three-story brick building. It will be air-conditioned throughout and will house laboratories, offices, and complete research library facilities. This consolidation will bring together in the central laboratory 115 scientists and other research personnel at Baytown.

They Have Retired

Ten employees of the Humble Companies in recent months have joined the ranks of those who have left their regular work behind to enjoy the remainder of their lives in deserved retirement. Eight of the group have spent long years at Baytown refinery; one has been employed in the Pipe Line Company; and one in the Production department.

WILLIAM H. GATES, main line engineer at Station C, retired on June 5 after 29 years service with the Pipe Line Company . . . CHARLES G. PRIDGEN, roustabout gang pusher at Goose Creek, retired on June 14 after 29 years of service. The eight Baytown refinery em-

ployees who have retired are: ALBERT L. DAHLQUIST, toolroom man with 25 years of service on May 27 . . . MAXEY T. WARD, SR., first class pipe fitter, on June 11 after nearly 31 years with Humble . . . WALTER S. SHIRLEY, chief clerk in the railroad department, on June 14 after 29 years of service . . . RICHARD M. JONES, sheet metal foreman, on June 27 after 23 years with Humble . . . JOSEPH L. LIRETTE, guard in the plant protection force, on July 15 after 30 years service . . . JAMES M. ANTLE, blacksmith first class, on July 16 after 27 years of service . . . CHARLES H. CUNNINGHAM, third class helper, on July 22 after 19 years of service . . . and ROBERT ROBERTS, general foreman of the Mechanical department at the refinery, on July 25 after more than 34 years of accredited service.

Deaths

Nine active employees and three Humble annuitants have died since our last report in these columns.

FRED B. ASHE, JR., 31, instrument technician at Baytown refinery, died on June 3 . . . PORT A. WATSON, 47, rod and tube hoist operator at London, on June 8 . . . JOHNNIE W. TAYLOR, 51, rotary driller at Stratton, on June 12 . . . HENRY L. HALLIBURTON, 59, pipe machine operator at Baytown refinery, on June 19 . . . ELBERT M. MARSHALL, 44, helper at Baytown refinery, on June 27 . . . JAMES P. FEALEY, 55, lease pumper and gauger at Flour Bluff, on July 6 . . . LARKIN M. HILTON, 59, toolroom man at Baytown refinery, on July 16 . . . LEO A. WALSHAK, JR., 24, lineman in the Southwest Texas Division of Humble Pipe Line Company, on July 18 . . . and DAVID E. GARRETT, 56, telegraph operator at Groesbeck Station of Humble Pipe Line Company, on July 19.

Annuitants who have expired since the last issue of THE HUMBLE WAY are: THOMAS F. NORRIS, who was a guard at Baytown refinery prior to his retirement, died on June 28 . . . OLLIE T. THORSEN, a carpenter in the Houston Office before his retirement, died on June 30 . . . and ERWEN D. ADAMS, junior district clerk for Humble Pipe Line Company at Longview before retirement, died on July 10.

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PROGRESS *with* PETROLEUM

Logging called for manpower and animal power almost exclusively until the turn of the century. Forest giants were felled by hand and skidded to shipping points by ox-drawn wagons. Today, electric drag saws cut the trees—saws which receive their energy from petroleum driven generators—and huge diesel-powered tractors and rugged trucks deliver the logs to railheads or to lumber mills.



